Genes culled from desert soils suggest potential medical resource

May 21 2012

Despite their ecologic similarity, soils from three geographically distinct areas of the American southwest harbor vastly different collections of small, biosynthetic genes, a finding that suggests the existence of a far greater diversity of potentially useful products than was previously supposed. The research is published in the May issue of *Applied and Environmental Microbiology*.

Natural compounds have been the sources of the majority of new drugs approved by the US Food and Drug Administration, and bacteria have been the biggest single source of these therapeutically relevant compounds. Most bacterially-derived antibiotic and anticancer agents were discovered by culturing bacteria from environmental samples, and then examining the metabolites they produce in laboratory fermentation studies. But the vast majority of bacterial species cannot be cultured, which suggested that the world might be awash in potentially useful, but unknown bacterial metabolites.

In this study, Sean Brady of the Howard Hughes Medical Institute, Rockefeller University, New York, NY, and colleagues extracted DNA from soils from the Sonoran Desert of Arizona, the Anza Borrego section of the Sonoran Desert of California, and the Great Basin Desert of Utah. They used this DNA to construct very large metagenomic DNA libraries, and screened these libraries for three of the most common classes of small molecule biosynthesis systems, type I modular polyketides, type II iterative polyketides, and non-ribosomal peptides, says Brady.

The investigators used PCR to amplify collections of gene fragments from each of the three libraries and compared these to assess the similarities and differences between the collections of genes cloned from each environment, says Brady.

"Our work suggests that the genomes of environmental bacteria could encode many additional drug-like molecules, including compounds that might serve, among other things, as new antibiotics and anticancer agents," says Brady. "This is a small preliminary study that warrants additional investigations of more environments and more extensive sequence analysis, but it suggests that environmental bacteria have the potential to encode a large additional treasure trove of new medicines."

More information: B.V.B. Reddy, D. Kallifidas, J.H. Kim, Z. Charlop-powers, Z. Feng, and S.F. Brady, 2012. Natural product biosynthetic gene diversity in geographically distinct soil microbiomes. *Appl. Environ. Microbiol.* 78:3744-3752.

Provided by American Society for Microbiology